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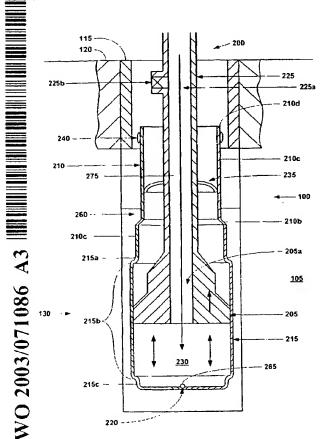
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(54) Tide: MONO-DIAMITTER WILLBORE CASING



(57) Abstract: A mono-diameter wellbore easing.

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A US 6,085,838 A (VERCAEMER et al.) 11 July 2000 (11.07.02), figures 5-7. Further documents are listed in the continuation of Box C. Special Caspories of clied documents: **Purchase document family annex.** Special Caspories of clied documents: **Purchase document defining the general stace of the art which is not considered to be of particular relevance or understand the principle or relevant possages are principled and so in conflict with the application but clied to understand the principle or counselored to involve an investive date of earlier applicating or patent published on or after the international filing date or considered on or after the international filing date or principly designed and one considered to involve an investive date of the scarted or proving the action of union cannot be confidered are dead or after the international filing date or principly and action of union cannot be confidered are dead or after the international filing date or principly and action of the considered to involve an investive date of the confidered area of the confidered novel or cannot be considered to involve an investive step when the document is taken after the meaning and the confidered and or the confidered in union cannot be confidered and or after the international cannot be confidered and or after the internation ca
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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category * Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No A US 2002/0033261 A1 (METCALFE) 21 March 2002 (21.03.02), summary. 1-55 A US 6,085,838 A (VERCAEMER et al.) 11 July 2000 (11.07.02), figures 5-7. 1-55 **Special caregories of cited documents: **Special caregories of cited documents: **T* Jacer document upublished after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention accounts of particular relevance. **E* earlier application or parent published on or after the international filing document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to invertible and position of particular relevance; the claimed invention cannot be considered to invertible and position of particular relevance.
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(54) Title: MONO-DIAMETER WELLBORE CASING

(57) Abstract: A mono-diameter wellbore casing.

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AMENDED CLAIMS

[Received by the International Bureau on 15 July 2004 (15.07.04): original claims 1 - 55 amended; new claims 56 - 78 added (2 pages)]

Claims

- 1. An apparatus for forming a wellbore casing in a borehole located in a subterranean formation including a preexisting wellbore casing, comprising:
 - a support member including a first fluid passage;
 - an expansion cone coupled to the support member including a second fluid passage fluidicly coupled to the first fluid passage;
 - an expandable tubular liner movably coupled to the expansion cone; and an expandable shoe coupled to the expandable tubular liner; wherein the expansion cone is adjustable to a plurality of stationary positions.
- 2. The apparatus of claim 1, wherein the expandable shoe includes a valveable fluid passage for controlling the flow of fluidic materials out of the expandable shoe.
- 3. The apparatus of claim 1, wherein the expandable shoe includes: an expandable portion; and a remaining portion coupled to the expandable portion; wherein the outer circumference of the expandable portion is greater than the outer circumference of the remaining portion.
- 4. The apparatus of claim 3, wherein the expandable portion includes: one or more inward folds.
- 5. The apparatus of claim 3, wherein the expandable portion includes: one or more corrugations.
- 6. The apparatus of claim 1, wherein the expandable shoe includes: one or more inward folds.
- 7. The apparatus of claim 1, wherein the expandable shoe includes: one or more corrugations.
- 8. A method of forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

installing a tubular liner, an adjustable expansion cone, and a shoe in the borehole; radially expanding at least a portion of the shoe by a process comprising: adjusting the adjustable expansion cone to a first outside diameter; and injecting a fluidic material into the shoe; and radially expanding at least a portion of the tubular liner by a process comprising: adjusting the adjustable expansion cone to a second outside diameter; and injecting a fluidic material into the borehole below the expansion cone.

- 9. The method of claim 8, wherein the first outside diameter of the adjustable expansion cone is greater than the second outside diameter of the adjustable expansion cone.
- 10. The method of claim 8, wherein radialty expanding at least a portion of the shae further comprises:

lowering the adjustable expansion cone into the shoe; and adjusting the adjustable expansion cone to the first outside diameter.

11. The method of claim 8, wherein radially expanding at least a portion of the shoe further comprises:

pressurizing a region within the shoe below the adjustable expansion cone using a fluidic material; and

pressurizing an annular region above the adjustable expansion cone using the fluidic material.

12. The method of claim 8. wherein radially expanding at least a portion of the tubular liner further comprises:

pressurizing a region within the shoe below the adjustable expansion cone using a fluidic material; and

pressurizing an annular region above the adjustable expansion cone using the fluidic material.

13. A system for forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

means for installing a tubular liner, an adjustable expansion cone, and a shoe in the borehole:

means for radially expanding at least a portion of the shoe comprising:
means for adjusting the adjustable expansion cone to a first outside diameter; and
means for injecting a fluidic material into the shoe; and
means for radially expanding at least a portion of the tubular liner comprising:
means for adjusting the adjustable expansion cone to a second outside diameter;
and

means for injecting a fluidic material into the borehole below the adjustable expansion cone.

- 14. The system of claim 13, wherein the first outside diameter of the adjustable expansion cone is greater than the second outside diameter of the adjustable expansion cone.
- 15. The system of claim 13, wherein the means for radially expanding at least a portion of the shoe further comprises:

means for lowering the adjustable expansion cone into the shoe; and means for adjusting the adjustable expansion cone to the first outside diameter.

- 16. The system of claim 13, wherein the means for radially expanding at least a portion of the shoe further comprises:
 - means for pressurizing a region within the shoe below the adjustable expansion cone using a fluidic material; and
 - means for pressurizing an annular region above the adjustable expansion cone using the fluidic material.
- 17. The system of claim 13, wherein the means for radially expanding at least a portion of the tubular liner further comprises:

means for pressurizing a region within the shoe below the adjustable expansion cone using a fluidic material; and

means for pressurizing an annular region above the adjustable expansion cone using the fluidic material.

18. A wellbore casing positioned in a borehole within a subterranean formation, comprising:

19.

cone.

a first wellbore casing comprising: an upper portion of the first wellbore casing; and a lower portion of the first wellbore casing coupled to the upper portion of the first wellbore casing; wherein the inside diameter of the upper portion of the first wellbore casing in less than the inside diameter of the lower portion of the first wellbore casing; and a second wellbore casing comprising: an upper portion of the second wellbore casing that overlaps with and is coupled to the lower portion of the first wellbore casing; and a lower portion of the second wellbore casing coupled to the upper portion of the second wellbore casing; wherein the inside diameter of the upper portion of the second wellbore casing is less than the inside diameter of the lower portion of the second wellbore casing: and wherein the inside diameter of the upper portion of the first wellbore casing is equal to the inside diameter of the upper portion of the second wellbore casing: wherein the second wellbore casing is coupled to the first wellbore casing by the process of: installing the second wellbore casing and an adjustable expansion cone within the borehole: radially expanding at least a portion of the lower portion of the second wellbore casing by a process comprising: adjusting the adjustable expansion cone to a first outside diameter, and injecting a fluidic material into the second wellbore casing; and radially expanding at least a portion of the upper portion of the second wellbore casing by a process comprising: adjusting the adjustable expansion cone to a second outside diameter; and injecting a fluidic material into the borehole below the adjustable expansion cone. The wellbore casing of claim 18, wherein the first outside diameter of the adjustable expansion cone is greater than the second outside diameter of the adjustable expansion

20. The wellbore casing of claim 18, wherein radially expanding at least a portion of the lower portion of the second wellbore casing further comprises:

lowering the adjustable expansion cone into the lower portion of the second wellbore casing; and

adjusting the adjustable expansion cone to the first outside diameter.

21. The wellbore casing of claim: 18, wherein radially expanding at least a portion of the lower portion of the second wellbore casing further comprises:

pressurizing a region within the lower portion of the second wellbore casing below the adjustable expansion cone using a fluidic material; and pressurizing an annular region above the adjustable expansion cone using the fluidic material.

The wellbore casing of claim 18, wherein radially expanding at least a portion of the upper portion of the second wellbore casing further comprises:

pressurizing a region within the lower portion of the second wellbore casing below the adjustable expansion cone using a fluidic material; and pressurizing an annular region above the adjustable expansion cone using the fluidic material.

- 23. An apparatus for forming a wellbore casing in a borehole located in a subterranean formation including a preexisting wellbore casing, comprising:
 - a support member including a first fluid passage;
 - a first adjustable expansion cone coupled to the support member including a second fluid passage fluidicity coupled to the first fluid passage;
 - a second adjustable expansion cone coupled to the support member including a third fluid passage fluidicity coupled to the first fluid passage;
 - an expandable tubular liner movably coupled to the first and second adjustable expansion cones; and

an expandable shoe coupled to the expandable tubular liner.

24. The apparatus of claim 23, wherein the expandable shoe includes a valveable fluid passage for controlling the flow of fluidic materials out of the expandable shoe.

- 25. The apparatus of claim 23, wherein the expandable shoe includes:
 an expandable portion; and
 a remaining portion coupled to the expandable portion;
 wherein the outer circumference of the expandable portion is greater than the outer
 circumference of the remaining portion.
- 26. The apparatus of claim 25, wherein the expandable portion includes: one or more inward folds.
- 27: The apparatus of claim 25, wherein the expandable portion includes: one or more corrugations.
- 28. The apparatus of claim 23, wherein the expandable shoe includes: one or more inward folds.
- 29. The apparatus of claim 23 wherein the expandable shoe includes: one or more corrugations.
- 30. A method of forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

installing a tubular liner, an upper adjustable expansion cone, a lower adjustable expansion cone, and a shoe in the borehole;

radially expanding at least a portion of the shoe by a process comprising:

adjusting the lower adjustable expansion cone to an increased outside diameter; and

Injecting a fluidic material into the shoe; and

radially expanding at least a portion of the tubular liner by a process comprising:

adjusting the lower adjustable expansion cone to a reduced outside diameter;

adjusting the upper adjustable expansion cone to an increased outside diameter; and

injecting a fluidic material into the borehole below the lower adjustable expansion

cone.

31. The method of claim 30, wherein the increased outside diameter of the lower adjustable expansion cone is greater than the increased outside diameter of the upper adjustable expansion cone.

- 32. The method of claim 30, wherein the reduced outside diameter of the lower adjustable expansion cone is less than or equal to the increased outside diameter of the upper adjustable expansion cone.
- 33. The method of claim 30, wherein radially expanding at least a portion of the shee further comprises:

lowering the lower adjustable expansion cone into the shoe; and adjusting the lower adjustable expansion cone to the increased outside diameter.

34. The method of claim 30, wherein radially expanding at least a portion of the shoe further comprises:

pressurizing a region within the shoe below the lower adjustable expansion cone using a fluidic material; and

pressurizing an annular region above the upper adjustable expansion cone using the fluidic material.

35. The method of claim 30, wherein radially expanding at least a portion of the tubular liner further comprises:

pressurizing a region within the shoe below the lower adjustable expansion cone using a fluidic material; and

pressurizing an annular region above the upper adjustable expansion cone using the fluidic material.

36. A system for forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

means for installing a tubular liner, an upper adjustable expansion cone, a lower adjustable expansion cone, and a shoe in the borehole;

means for radially expanding at least a portion of the shoe comprising:

means for adjusting the lower adjustable expansion cone to an increased outside diameter; and

means for injecting a fluidic material into the shoe; and

means for radially expanding at least a portion of the tubular liner comprising:

means for adjusting the lower adjustable expansion cone to a reduced outside diameter;

means for adjusting the upper adjustable expansion cone to an increased outside diameter; and means for injecting a fluidic material into the borehole below the lower adjustable expansion cone.

- 37. The system of claim 36, wherein the increased outside diameter of the lower adjustable expansion cone is greater than the increased outside diameter of the upper adjustable expansion cone.
- 38. The system of claim 36, wherein the reduced outside diameter of the lower adjustable expansion cone is less than or equal to the increased outside diameter of the upper adjustable expansion cone.
- 39. The system of claim 36, wherein the means for radially expanding at least a portion of the shoe further comprises:

means for lowering the lower adjustable expansion cone into the shoe; and means for adjusting the lower adjustable expansion cone to the increased outside diameter.

40. The system of claim 36, wherein the means for radially expanding at least a portion of the shoe further comprises:

means for pressurizing a region within the shoe below the lower adjustable expansion cone using a fluidic material; and means for pressurizing an annular region above the upper adjustable expansion cone using the fluidic material.

41. The system of claim 36, wherein the means for radially expanding at least a portion of the tubular liner further comprises:

means for pressurizing a region within the shoe below the lower adjustable expansion cone using a fluidic material; and means for pressurizing an annular region above the upper adjustable expansion cone using the fluidid material.

- 42. A wellbore casing positioned in a borehole within a subterranean formation, comprising:
 - a first wellbore casing comprising:
 - an upper ponion of the filet wellbore casing; and
 - a lower portion of the first wellbore casing coupled to the upper portion of the first wellbore casing;
 - wherein the inside diameter of the upper portion of the first wellbore casing is less than the inside diameter of the lower portion of the first wellbore casing; and a second wellbore casing comprising:
 - an upper portion of the second wellbore casing that overlaps with and is coupled to the lower portion of the first wellbore casing; and
 - a lower portion of the second wellbore casing coupled to the upper portion of the second wellbore casing;
 - wherein the Inside diameter of the upper portion of the second wellbore casing is less than the inside diameter of the lower portion of the second wellbore casing; and
 - wherein the inside diameter of the upper portion of the first wellbore casing is equal to the inside diameter of the upper portion of the second wellbore casing; wherein the second wellbore casing is coupled to the first wellbore casing by the process of:
 - installing the second wellbure casing, an upper adjustable expansion cone, a lower adjustable expansion cone, and a shoe in the borehole;
 - radially expanding at least a portion of the lower portion of the second wellbore casing shoe by a process comprising:
 - adjusting the lower adjustable expansion cone to an increased outside diameter; and injecting a fluidic material into the lower portion of the second wellbore casing; and radially expanding at least a portion of the upper portion of the second wellbore casing by a process comprising:

adjusting the lower adjustable expansion cone to a reduced outside diameter; adjusting the upper adjustable expansion cone to an increased outside diameter; and injecting a fluidic material into the borehole below the lower adjustable expansion cone.

- 43. The wellbore casing of claim 42, wherein the increased outside diameter of the lower adjustable expansion cone is greater than the increased outside diameter of the upper adjustable expansion cone.
- 44. The wellbore casing of claim 42, wherein the reduced outside diameter of the lower adjustable expansion cone is less than or equal to the increased outside diameter of the upper adjustable expansion cone.
- 45. The wellbore casing of claim 42, wherein radially expanding at least a portion of the lower portion of the second wellbore casing further comprises:

lowering the lower adjustable expansion cone into the lower portion of the second wellbore casing; and

adjusting the lower adjustable expansion cone to the increased outside diameter.

- The wellbore casing of claim 42, wherein radially expanding at least a portion of the lower portion of the second wellbore casing further comprises:
 - pressurizing a region within the lower portion of the second wellbore casing below the lower adjustable expansion cone using a fluidic material; and pressurizing an annular region above the upper adjustable expansion cone using the fluidic material.
- 47. The wellbore casing of claim 42, wherein radially expanding at least a portion of the upper portion of the second wellbore casing further comprises:

pressurizing a region within the lower portion of the second wellbore casing below the lower adjustable expansion cone using a fluidic material; and pressurizing an annular region above the upper adjustable expansion cone using the fluidic material.

- 48. An apparatus for forming a wellbore casing in a borehole located in a subterranean formation including a preexisting wellbore casing, comprising:
 - a support member including a first fluid passage;

an expansion cone coupled to the support member including a second fluid passage fluidictly coupled to the first fluid passage;

an expandable tubular liner movably coupled to the expansion cone; and

an expandable shoe coupled to the expandable tubular liner comprising:

a valveable fluid passage for controlling the flow of fluidic materials out of the
expandable shoe

an expandable portion comprising one or more inward folds; and
a remaining portion coupled to the expandable portion;
wherein the outer circumference of the expandable portion is greater than the outer
circumference of the expandable portion;

wherein the expansion cone is adjustable to a plurality of stationary positions.

49. A method of forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

installing a tubular liner, an adjustable expansion cone, and a shoe in the borehole; radially expanding at least a portion of the shoe by a process comprising: lowering the adjustable expansion cone into the shoe; adjusting the adjustable expansion cone to a first outside diameter;

pressurizing a region within the shoe below the adjustable expansion cone using a fluidic material; and

pressurizing an annular region above the adjustable expansion cone using the fluidic material; and

radially expanding at least a portion of the tubular liner by a process comprising:
adjusting the adjustable expansion cone to a second outside diameter;
pressurizing a region within the shoe below the adjustable expansion cone using a
fluidic material; and

pressurizing an annular region above the adjustable expansion cone using the fluidic material;

wherein the first outside diameter of the adjustable expansion cone is greater than the second outside diameter of the adjustable expansion cone.

50. A system for forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

means for installing a tubular liner, an adjustable expansion cone, and a shoe in the borehole:

means for radially expanding at least a portion of the shoe comprising: means for lowering the adjustable expansion cone into the shoe;

means for adjusting the adjustable expansion cone to a first outside diameter, means for pressurizing a region within the shoe below the adjustable expansion cone using a fluidic material; and

means for pressurizing an annular region above the adjustable expansion cone using the fluidic material; and

means for radially expanding at least a portion of the tubular liner comprising:
means for adjusting the adjustable expansion cone to a second outside diameter;
means for pressurizing a region within the shoe below the adjustable expansion cone

using a fluidic material; and

means for pressurizing an annular region above the adjustable expansion cone using the fluidic material.

wherein the first outside diameter of the adjustable expansion cone is greater than the second outside diameter of the adjustable expansion cone.

- 51. A wellbore casing positioned in a borehole within a subterranean formation, comprising:
 - a first wellbore casing comprising:

an upper portion of the first wellbore casing; and

a lower portion of the first wellbore casing coupled to the upper portion of the first wellbore casing;

wherein the inside diameter of the upper portion of the first wellbore casing is less than the inside diameter of the lower portion of the first wellbore casing; and a second wellbore casing comprising:

an upper portion of the second wellbore casing that overlaps with and is coupled to the lower portion of the first wellbore casing; and

a lower portion of the second wellbore casing coupled to the upper portion of the second wellbore casing;

wherein the inside diameter of the upper portion of the second wellbore casing is less than the inside diameter of the lower portion of the second wellbore casing; and

wherein the inside diameter of the upper portion of the first wellbore casing is equal to the inside diameter of the upper portion of the second wellbore casing; wherein the second wellbore casing is coupled to the first wellbore casing by the process of:

installing the second welfbore casing and an adjustable expansion cone in the borehole;

radially expanding at least a portion of the lower portion of the second wellbore casing by a process comprising:

lowering the adjustable elipansion cone into the lower portion of the second wellbore casing;

adjusting the adjustable expansion cone to a first outside diameter;

pressurizing a region within the lower portion of the second wellbore casing below

the adjustable expansion cone using a fluidic material; and

pressurizing an annular region above the adjustable expansion cone using the fluidic material; and

radially expanding at least a portion of the upper portion of the second wellbore casing by a process comprising:

adjusting the adjustable expansion cone to a second outside diameter;

pressurizing a region within the shoe below the adjustable expansion cone using a fluidic material; and

pressurizing an annular region above the adjustable expansion cone using the fluidic material;

wherein the first outside diameter of the adjustable expansion cone is greater than the second outside diameter of the adjustable expansion cone.

- 52. An apparatus for forming a wellbore casing in a borehole located in a subterranean formation including a preexisting wellbore casing, comprising:
 - a support member including a first fluid passage;
 - a first adjustable expansion cone coupled to the support member including a second fluid passage fluidicty coupled to the first fluid passage;
 - a second adjustable expansion cone coupled to the support member including a third fluid passage fluidicily coupled to the first fluid passage;
 - an expandable tubular liner movably coupled to the first and second adjustable expansion cones; and

an expandable shoe coupled to the expandable tubular liner comprising:

a valveable fluid passage for controlling the flow of fluidic materials out of the expandable shoe;

an expandable portion comprising one or more inwards folds; and

a remaining portion coupled to the expandable portion;

wherein the outer circumference of the expandable portion is greater than the outer circumference of the remaining portion.

53. A method of forming a wellbore casing in a subterranean formation having a precising wellbore casing positioned in a borehole, comprising:

installing a tubular liner, an upper adjustable expansion cone, a lower adjustable expansion cone, and a shoe in the borehole;

radially expanding at least a portion of the shoe by a process comprising: lowering the lower adjustable expansion cone into the shoe;

adjusting the lower adjustable expansion cone to an increased outside diameter; pressurizing a region within the shoe below the lower adjustable expansion cone

using a fluidic material; and

pressurizing an annular region above the upper adjustable expansion cone using the fluidic material; and

radially expanding at least a portion of the tubular liner by a process comprising: adjusting the lower adjustable expansion cone to a reduced outside diameter; adjusting the upper adjustable expansion cone to an increased outside diameter; pressurizing a region within the shoe below the lower adjustable expansion cone

using a fluidic material; and

pressurizing an annular region above the upper adjustable expansion cone using the fluidic material;

wherein the increased outside diameter of the lower adjustable expansion cone is greater than the increased outside diameter of the upper adjustable expansion cone; and

wherein the reduced outside diameter of the lower adjustable expansion cone is less than or equal to the increased outside diameter of the upper adjustable expansion cone.

54. A system for forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

means for installing a tubular liner, an upper adjustable expansion cone, a lower adjustable expansion cone; and a shoe in the borehole; means for radially expanding at least a portion of the shoe comprising:

means for lowering the lower adjustable expansion cone into the shoe; means for adjusting the lower adjustable expansion cone to an increased outside

diameter,

means for pressurizing a region within the shoe below the lower adjustable expansion cone using a fluidic material; and

means for pressurizing an annular region above the upper adjustable expansion cone using the fluidic material; and

means for radially expanding at least a portion of the tubular liner comprising:

means for adjusting the lower adjustable expansion cone to a reduced outside diameter;

means for adjusting the upper adjustable expansion cone to an increased outside diameter;

means for pressurizing a region within the shoe below the lower adjustable expansion cone using a fluidic material; and

means for pressurizing an annular region above the upper adjustable expansion cone using the fluidic material;

wherein the increased outside diameter of the lower adjustable expansion cone is greater than the increased outside diameter of the upper adjustable expansion cone; and

wherein the reduced outside diameter of the lower adjustable expansion cone is less than or equal to the increased outside diameter of the upper adjustable expansion cone.

- 55. A wellbore casing positioned in a borehole within a subterranean formation, comprising:
 - a first wellbore casing comprising:

an upper portion of the first wellbore casing; and

a lower portion of the first wellbore casing coupled to the upper portion of the first wellbore casing;

wherein the inside diameter of the upper portion of the first wellbore casing is less than the inside diameter of the lower portion of the first wellbore casing; and a second wellbore casing comprising:

an upper portion of the second wellbore casing that overlaps with and is coupled to the lower portion of the first wellbore casing; and

process of:

fluidic material: and:

- a lower portion of the second wellbore casing coupled to the upper portion of the second wellbore casing;
- wherein the inside diameter of the upper portion of the second wellbore casing is less than the inside diameter of the lower portion of the second wellbore casing; and
- wherein the inside diameter of the upper portion of the first wellbore casing is equal to the inside diameter of the upper portion of the second wellbore casing; wherein the second wellbore casing is coupled to the first wellbore casing by the
- installing the second wellbore casing, an upper adjustable expansion cone, and a lower adjustable expansion cone in the borehole;
- radially expanding at least a portion of the shoe by a process comprising:
 lowering the lower adjustable expansion cone into the lower portion of the second wellbore casing;
- adjusting the lower adjustable expansion cone to an increased outside diameter; pressurizing a region within the lower portion of the second wellbore casing below the lower adjustable expansion cone using a fluidic material; and pressurizing an annular region above the upper adjustable expansion cone using the
- radially expanding at least a portion of the upper portion of the second wellbore casing by a process comprising:
- adjusting the lower adjustable expansion cone to a reduced outside diameter, adjusting the upper adjustable expansion cone to an increased outside diameter, pressurizing a region within the lower portion of the second wellbore casing below
- the lower adjustable expansion cone using a fluidic material; and pressurizing an annular region above the upper adjustable expansion cone using the fluidic material;
- wherein the increased outside diameter of the lower adjustable expansion cone is greater than the increased outside diameter of the upper adjustable expansion cone; and
- wherein the reduced outside diameter of the lower adjustable expansion cone is less than or equal to the increased outside diameter of the upper adjustable expansion cone.

56. An apparatus for forming a wellbore casing in a borehole located in a subterranean formation including a preexisting wellbore casing, comprising:

a support member defining a first fluid passage;
an expansion device coupled to the support member defining a second fluid passage fluidicly coupled to the first fluid passage;
an expandable tubular liner movably coupled to the expansion device; and

an expandable tubular liner movably coupled to the expansion device; and an expandable shoe coupled to the expandable tubular liner; wherein the expansion device is adjustable to a plurality of stationary positions.

57. A method of forming a wellbore casing in a subterranear formation having a preexisting wellbore casing positioned in a borehole, comprising installing a tubular liner, an adjustable expansion device, and a shoe in the borehole; radially expanding at least a portion of the shoe by a process comprising: adjusting the adjustable expansion device to a first outside diameter; and injecting a fluidic material into the shoe; and radially expanding at least a portion of the tubular liner by a process comprising: adjusting the adjustable expansion device to a second outside diameter; and injecting a fluidic material into the borehole below the adjustable expansion device.

58. A system for forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

means for installing a tubular liner, an adjustable expansion device, and a shoe in the borehole:

means for radially expanding at least a portion of the shoe comprising:

means for adjusting the adjustable expansion device to a first outside diameter; and

means for injecting a fluidic material into the shoe; and
means for radially expanding at least a portion of the tubular liner comprising;
means for adjusting the adjustable expansion device to a second outside
diameter, and

means for injecting a fluidic material into the borehole below the adjustable expansion device.

- 59. A wellbore casing positioned in a borehole within a subterranean formation, comprising:
 - a first wellbore casing comprising:
 - an upper portion of the first wellbore casing; and
 - a lower portion of the first/wellbore casing coupled to the upper portion of the first wellbore casing;
 - wherein the inside diameter of the upper portion of the first wellbore casing in less than the inside diameter of the lower portion of the first wellbore casing; and a second wellbore casing pointrising:
 - an upper portion of the second wellbore casing that overlaps with and is coupled to the lower portion of the first wellbore casing; and
 - a lower portion of the second wellbore casing coupled to the upper portion of the second wellbore casing;
 - wherein the inside diameter of the upper portion of the second wellbore casing is less than the inside diameter of the lower portion of the second wellbore casing; and
 - wherein the inside diameter of the upper portion of the first wellbore casing is equal to the inside diameter of the upper portion of the second wellbore casing; wherein the second wellbore casing is coupled to the first wellbore casing by the process of:
 - installing the second wellbore casing and an adjustable expansion device within the borehole;
 - radially expanding at least a portion of the lower portion of the second wellbore casing by a process comprising:
 - adjusting the adjustable expansion device to a first outside diameter,
 - injecting a fluidic material into the second wellbore casing; and radially expanding at least a portion of the upper portion of the second wellbore casing by a process comprising:
 - adjusting the adjustable expansion device to a second outside diameter and
 - injecting a fluidic material into the borehole below the adjustable expansion device.

- 60. An apparatus for forming a wellbore casing in a borehole located in a subtenanean formation including a preexisting wellbore casing, comprising:
 - a support member including a first fluid passage;
 - a first adjustable empansion device coupled to the support member including a second fluid passage fluidictly coupled to the first fluid passage;
 - a second adjustable expansion device coupled to the support member including a third fluid passage fluidicly coupled to the first fluid passage;
 - an expandable tubular liner movably coupled to the first and second adjustable expansion devices, and
 - an expandable shoe coupled to the expandable tubular liner.
- 61. A method of forming a wellbore casing in a subterranean formation having preexisting wellbore casing positioned in a borehole, comprising:
 - installing a tubular liner, an upper adjustable expansion device, a lower adjustable expansion device, and a shoe in the borehole;
 - radially expanding at least a portion of the shoe by a process comprising:

 adjusting the lower adjustable expansion device to an increased outside

 diameter, and

injecting a fluidic material into the shoe; and

- radially expanding at least a portion of the tubular liner by a process comprising:
 adjusting the lower adjustable expansion device to a reduced outside
 diameter:
 - adjusting the upper adjustable expansion device to an increased outside dlameter; and
 - injecting a fluidic material into the borehole below the lower adjustable expansion device.
- 62. A system for forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:
 - means for installing a tubular liner, an upper adjustable expansion device, a lower adjustable expansion device, and a shoe in the borehole;
 - means for radially expanding at least a portion of the shoe comprising:
 - means for adjusting the lower adjustable expansion device to an increased outside diameter; and

means for injecting a fluidic material into the shoe; and means for radially expanding at least a portion of the tubular liner comprising: means for adjusting the lower adjustable expansion device to a reduced outside diameter;

means for adjusting the upper adjustable expansion device to an increased outside diameter; and

means for injecting a fluidic material into the borehole below the lower adjustable expansion device.

63. A wellbore casing positioned in a berehole within a subterranean formation, comprising:

a first wellbore casing comprising:

an upper portion of the first wellbore casing; and

a lower portion of the first wellbore casing coupled to the upper portion of the first wellbore casing:

wherein the inside diameter of the upper portion of the first wellbore casing is less than the inside diameter of the lower portion of the first wellbore casing; and a second wellbore casing comprising:

an upper portion of the second wellbore casing that overlaps with and is coupled to the lower portion of the first wellbore casing; and

a lower portion of the second wellbore casing coupled to the upper portion of the second wellbore casing;

wherein the inside diameter of the upper portion of the second wellbore casing is less than the inside diameter of the lower portion of the second wellbore casing; and

wherein the inside diameter of the upper portion of the first wellbore casing is equal to the inside diameter of the upper portion of the second wellbore casing; wherein the second wellbore casing is coupled to the first wellbore casing by the process of:

installing the second wellbore casing, an upper adjustable expansion device, a lower adjustable expansion device, and a shoe in the borehole; radially expanding at least a portion of the lower portion of the second wellbore casing shoe by a process comprising:

adjusting the lower adjustable expansion device to an increased outside diameter, and

injecting a fluidic material into the lower portion of the second wellbore casing, and

radially expanding at least a portion of the upper portion of the second wellbore casing by a process comprising:

adjusting the lower adjustable expansion device to a reduced outside diameter;

adjusting the upper adjustable expansion device to an increased outside diameter, and

injecting a fluidic material into the borehole below the lower adjustable expansion device.

64. An apparatus for forming a wellbore casing in a borehole located in a subterranean formation including a preexisting wellbore casing, comprising:

a support member including a first fluid passage;

an expansion device coupled to the support member including a second fluid passage fluidicly coupled to the first fluid passage;

an expandable tubular linen movably coupled to the expansion device; and an expandable shoe coupled to the expandable tubular liner comprising: a valveable fluid passage for controlling the flow of fluidic materials out of the expandable shoe;

an expandable portion comprising one or more inward folds; and a remaining portion coupled to the expandable portion;

wherein the outer circumference of the expandable portion is greater than the outer circumference of the remaining portion;

wherein the expansion devide is adjustable to a plurality of stationary positions.

65. A method of forming a wellbbre casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

installing a tubular liner, an adjustable expansion device, and a shoe in the borehole; radially expanding at least a portion of the shoe by a process comprising: lowering the adjustable expansion device into the shoe; adjusting the adjustable expansion device to a first outside diameter;

pressurizing a region within the shoe below the adjustable expansion device using a fluidic material; and

pressurizing an annular region above the adjustable expansion device using the fluidic material; and

radially expanding at least a portion of the tubular liner by a process comprising:

adjusting the adjustable expansion device to a second outside diameter;

pressurizing a region within the shoe below the adjustable expansion device

using a fluidic material; and

pressurizing an antiular region above the adjustable expansion device using the fluidic material;

wherein the first outside diameter of the adjustable expansion device is greater than the second outside diameter of the adjustable expansion device.

66. A system for forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

means for installing a tubular liner, an adjustable expansion device, and a shoe in the borehole:

means for radially expanding at least a portion of the shoe comprising: means for lowering the adjustable expansion device into the shoe; means for adjusting the adjustable expansion device to a first outside diameter;

means for pressurizing a region within the shoe below the adjustable expansion device using a fluidic material; and

means for pressurizing an annular region above the adjustable expansion device using the fluidic material; and

means for radially expanding at least a portion of the tubular liner comprising:
means for adjusting the adjustable expansion device to a second outside diameter;
means for pressurizing a region within the shoe below the adjustable expansion
device using a fluidic material; and

means for pressurizing an annular region above the adjustable expansion device using the fluidic material;

wherein the first outside diameter of the adjustable expansion device is greater than the second outside diameter of the adjustable expansion device.

- 67. A wellbore casing positioned in a borehole within a subterranean formation, comprising:
 - a first wellbore casing comprising:
 - an upper portion of the first wellbore casing; and
 - a lower portion of the first wellbore casing coupled to the upper portion of the first wellbore casing;
 - wherein the inside diameter of the upper portion of the first wellbore casing is less than the inside diameter of the lower portion of the first wellbore casing; and a second wellbore casing comprising:
 - an upper portion of the second wellbore casing that overlaps with and is coupled to the lower portion of the first wellbore casing; and
 - a lower portion of the second wellbore casing coupled to the upper portion of the second wellbore casing;
 - wherein the inside diameter of the upper portion of the second wellbore casing is less than the inside diameter of the lower portion of the second wellbore casing;
 - wherein the inside diameter of the upper portion of the first wellbore casing is equal to the inside diameter of the upper portion of the second wellbore casing; wherein the second wellbore casing is coupled to the first wellbore casing by the

process of:

Installing the second wellbore casing and an adjustable expansion device in the borehole;

radially expanding at least a portion of the lower portion of the second wellbore casing by a process complising:

lowering the adjustable expansion device into the lower portion of the second wellbore casing;

adjusting the adjustable expansion device to a first outside diameter;

pressurizing a region within the lower portion of the second wellbore casing below the adjustable expansion device using a fluidic material; and

pressurizing an annular region above the adjustable expansion device using the fluidic material; and

radially expanding at least a portion of the upper portion of the second wellbore casing by a process comprising:

adjusting the adjustable expansion device to a second outside diameter;

pressurizing a region within the shoe below the adjustable expansion device using a fluidic material; and pressurizing an annular region above the adjustable expansion device using the fluidic material; wherein the first outside diameter of the adjustable expansion device is greater than the second outside diameter of the adjustable expansion device.

- 68. An apparatus for forming a wellopre casing in a borehole located in a subterranean formation including a preexisting wellbore casing, comprising:
 - a support member including a first fluid passage;
 - a first adjustable expansion device coupled to the support member including a second fluid passage fluidicly coupled to the first fluid passage;
 - a second adjustable expansion device coupled to the support member including a third fluid passage fluidicity coupled to the first fluid passage;
 - an expandable tubular liner movably coupled to the first and second adjustable expansion devices: and
 - an expandable shoe coupled to the expandable tubular liner comprising: a valveable fluid passage for controlling the flow of fluidic materials out of the expandable shoe:
 - an expandable portion comprising one or more inwards folds; and a remaining portion coupled to the expandable portion; wherein the outer circumference of the expandable portion is greater than the outer circumference of the remaining portion.
- 69. A method of forming a wellbore casing in; a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

installing a tubular liner, an upper adjustable expansion device, a lower adjustable expansion device, and a shoe in the borehole;

radially expanding at least a portion of the shoe by a process comprising:

lowering the lower adjustable expansion device into the shoe;

adjusting the lower adjustable expansion device to an increased outside diameter; pressurizing a region within the shoe below the lower adjustable expansion device

using a fluidic material; and

pressurizing an annular region above the upper adjustable expansion device using the fluidic material and

radially expanding at least a portion of the tubular liner by a process comprising: adjusting the lower adjustable expansion device to a reduced outside diameter; adjusting the upper adjustable expansion device to an increased outside diameter; pressurizing a region within the shoe below the lower adjustable expansion device using a fluidic material; and

pressurizing an annular region above the upper adjustable expansion device using the fluidic material:

wherein the increased outside diameter of the lower adjustable expansion device is greater than the increased outside diameter of the upper adjustable expansion device; and

wherein the reduced outside diameter of the lower adjustable expansion device is less than or equal to the increased outside diameter of the upper adjustable expansion device.

70. A system for forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

means for installing a tubular liner, an upper adjustable expansion device, a lower adjustable expansion device, and a shoe in the borehole;

means for radially expanding at least a portion of the shoe comprising:

means for lowering the lower adjustable expansion device into the shoe;

means for adjusting the lower adjustable expansion device to an increased outside diameter,

means for pressurzing a region within the shoe below the lower adjustable expansion device using a fluidic material; and

means for pressurizing an annular region above the upper adjustable expansion device using the fluidic material; and

means for radially expanding at least a portion of the tubular liner comprising:

means for adjusting the lower adjustable expansion device to a reduced outside diameter;

means for adjusting the upper adjustable expansion device to an increased outside diameter,

- means for pressurizing a region within the shoe below the lower adjustable expansion device using a fluidic material; and
- means for pressurizing an annular region above the upper adjustable expansion device using the fluidic material;

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- wherein the increased outside diameter of the lower adjustable expansion device is greater than the increased outside diameter of the upper adjustable expansion device; and
- wherein the reduced outside diameter of the lower adjustable expansion device is less than or equal to the increased outside diameter of the upper adjustable expansion device.
- 71. A wellbore casing positioned in a borehole within a subterranean formation, we comprising:
 - a first wellbore casing comprising
 - an upper portion of the first wellbare casing; and
 - a lower portion of the first wellbore casing coupled to the upper portion of the first wellbore casing;
 - wherein the inside diameter of the upper portion of the first wellbore casing is less than the inside diameter of the lower portion of the first wellbore casing; and a second wellbore casing comprising:
 - an upper portion of the second wellbore casing that overlaps with and is coupled to the lower portion of the first wellbore casing; and
 - a lower portion of the second wellbore casing coupled to the upper portion of the second wellbore casing;
 - wherein the inside diameter of the upper portion of the second wellbore casing is less than the inside diameter of the lower portion of the second wellbore casing; and
 - wherein the inside diameter of the upper portion of the first wellbore casing is equal to the inside diameter of the upper portion of the second wellbore casing;
 - wherein the second wellbore casing is coupled to the first wellbore casing by the process of:
 - installing the second wellbole casing, an upper adjustable expansion device, and a lower adjustable expansion device in the borehole;
 - radially expanding at least alportion of the shoe by a process comprising:

lowering the lower adjustable expansion device into the lower portion of the second wellbore casing;

adjusting the lower adjustable expansion device to an increased outside diameter; pressurizing a region within the lower pertion of the second wellbere casing below

the lower adjustable expansion device using a fluidic material; and pressurizing an annular region above the upper adjustable expansion device using the fluidic material; and

radially expanding at least a portion of the upper portion of the second wellbore casing by a process comprising:

adjusting the lower adjustable expansion device to a reduced outside diameter; adjusting the upper adjustable expansion device to an increased outside diameter; pressurizing a region within the lower portion of the second wellbore casing below

the lower adjustable expansion device using a fluidic material; and pressurizing an annular region above the upper adjustable expansion device using the fluidic material;

wherein the increased outside diameter of the lower adjustable expansion device is greater than the increased outside diameter of the upper adjustable expansion device; and

wherein the reduced outside diameter of the lower adjustable expansion device is less than or equal to the increased outside diameter of the upper adjustable expansion device.

72. An apparatus for radially expanding and plastically deforming a tubular member, comprising:

means for injecting fluidic materials into the tubular member to radially expand and plastically deform the tubular member; and

means for radially expanding and plastically deforming the tubular member by displacing an expansion device within the tubular member.

73. A method of forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

installing a tubular liner, an adjustable expansion device, and a shoe in the borehole; radially expanding at least a portion of the shoe by a process comprising: adjusting the adjustable expansion device to a first outside diameter, and

injecting a fluidic material into the shoe; and radially expanding at least a portion of the tubular liner by a process comprising; adjusting the adjustable expansion device to a second outside diameter; and displacing the adjustable expansion device relative to the tubular liner.

74. A system for forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

means for installing a tubular lines, an adjustable expansion device, and a shoe in the borehole:

means for radially expanding at least a portion of the shoe comprising:

means for adjusting the adjustable expansion device to a first outside

diameter; and

means for injecting a fluidic material into the shoe; and
means for radially expanding at least a portion of the tubular liner comprising:
means for adjusting the adjustable expansion device to a second outside
diameter; and

means for displacing the adjustable expansion device relative to the tubular liner.

- 75. A wellbore casing positioned in a borehole within a subterranean formation, comprising:
 - a first wellbore casing comprising:
 - an upper portion of the first wellbore casing; and
 - a lower portion of the first wellbore casing coupled to the upper portion of the first wellbore casing;
 - wherein the inside diameter of the upper portion of the first wellbore casing is less than the inside diameter of the lower portion of the first wellbore casing; and a second wellbore casing comprising:
 - an upper portion of the second wellbore casing that overlaps with and is coupled to the lower portion of the first wellbore casing; and
 - a lower portion of the second wellbore casing coupled to the upper portion of the second wellbore casing:

wherein the inside diameter of the upper portion of the second wellbore casing is less than the inside diameter of the lower portion of the second wellbore casing; and

wherein the inside diameter of the upper portion of the first wellbore casing is equal to the inside diameter of the upper portion of the second wellbore casing; wherein the second wellbore casing is coupled to the first wellbore casing by the process of:

installing the second wellbore casing and an adjustable expansion device within the boreholes

radially expanding at least a portion of the lower portion of the second wellbore casing by a process comprising:

adjusting the adjustable expansion device to a first outside diameter,

injecting a fluidic material into the second wellbore casing; and radially expanding at least a portion of the upper portion of the second wellbore casing by a process comprising:

adjusting the adjustable expansion device to a second outside diameter, and

displacing the adjustable expansion device relative to the tubular liner.

76. A method of forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

installing a tubular liner, an upper adjustable expansion device, a lower adjustable expansion device, and a shoe in the borehole;

radially expanding at least a portion of the shoe by a process comprising:

adjusting the lower adjustable expansion device to an increased outside

diameter, and

radially expanding at least a portion of the tubular liner by a process comprising:

adjusting the lower adjustable expansion device to a reduced outside

diameter:

adjusting the upper adjustable expansion device to an increased outside diameter; and

displacing the upper adjustable expansion device relative to the tubular liner.

77. A system for forming a wellbore casing in a subterranean formation having a preexisting wellbore casing positioned in a borehole, comprising:

means for installing a tubular liner an upper adjustable expansion device, a lower adjustable expansion device, and a shoe in the borehole;

means for radially expanding at least a portion of the shoe comprising:

means for adjusting the lower adjustable expansion device to an increased outside diameter; and

means for injecting a fluidig material into the shoe; and

means for radially expanding at least a portion of the tubular liner comprising:

means for adjusting the lower adjustable expansion device to a reduced outside diameter;

means for adjusting the upper adjustable expansion device to an increased outside diameter; and

means for displacing the upper adjustable expansion device relative to the tubular liner.

- 78. A wellbore casing positioned in a borehole within a subterranean formation, comprising:
 - a first wellbore casing comprising:

an upper portion of the first wellboge casing; and

a lower portion of the first wellbore casing coupled to the upper portion of the first wellbore casing;

wherein the inside diameter of the upper portion of the first wellbore casing is less than the inside diameter of the lower portion of the first wellbore casing; and a second wellbore casing comprising;

an upper portion of the second wellbore casing that overlaps with and is coupled to the lower portion of the first wellbore casing; and

a lower portion of the second wellbore casing coupled to the upper portion of the second wellbore casing:

wherein the inside diameter of the upper portion of the second wellbore casing is less than the inside diameter of the lower portion of the second wellbore casing; and

wherein the inside diameter of the upper portion of the first wellbore casing is equal to the inside diameter of the upper portion of the second wellbore casing; wherein the second wellbore casing is coupled to the first wellbore casing by the process of:

installing the second wellbore casing, an upper adjustable expansion device, a lower adjustable expansion device, and a shoe in the borehole; radially expanding at least a portion of the lower portion of the second wellbore casing thee by a process comprising:

adjusting the lower adjustable expansion device to an increased outside diagneter; and

injecting a fluidic material into the lower portion of the second wellbore casing; and

radially expanding at least a portion of the upper portion of the second wellbore casing by a process comprising:

adjusting the lower adjustable expansion device to a reduced outside diameter.

adjusting the upper adjustable expansion device to an increased outside diameter, and

displacing the upper adjustable expansion device relative to the tubular lines.

INTERNATIONAL SEARCH REPORT

International application No.	
PCT/US03/00609	

Pour 166/380, 207 166/380, 207 166/380, 207 166/380, 207 166/380, 207 12.2, 216, 217	A. CLASSIFICATION OF SUBJECT MATTER			
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